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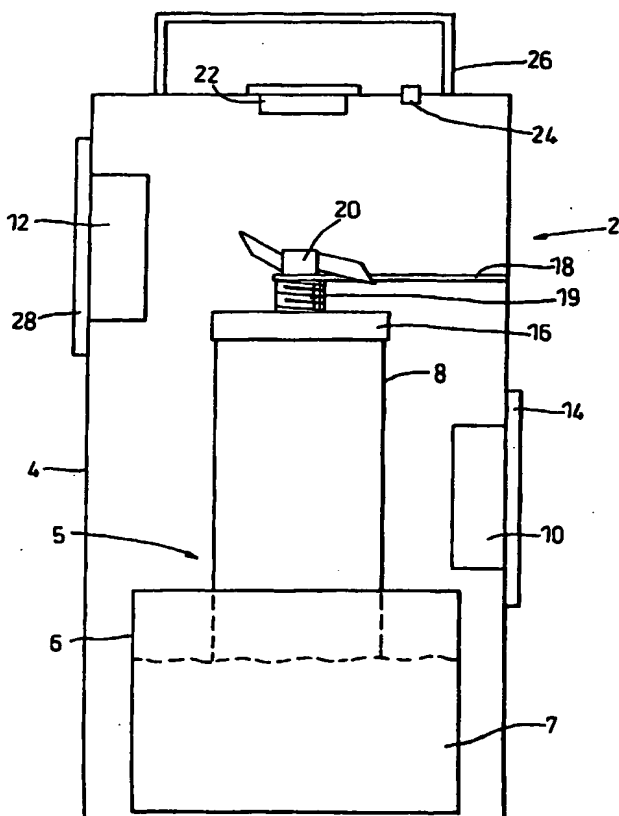
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**(54) Title: FLUID DISPENSING DEVICES**



**(57) Abstract:** The invention provides a fluid dispensing device comprising a liquid reservoir for housing a liquid, a wick, arranged in use, to draw liquid from the liquid reservoir, and means to effect substantial airflow in the region of the wick and away from the device. The invention further provides a method of dispensing a fluid, comprising the steps of: a) providing a device described above, wherein the liquid reservoir contains liquid; and (b) effecting substantial airflow in the region of the wick of the device, in order to increase the rate of evaporation of the liquid drawn through the wick and effect movement of the evaporated liquid away from the device.



SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

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Improvements in and Relating to Fluid Dispensing DevicesField of the Invention

- 5 This invention relates to fluid dispensing devices, and to methods of dispensing fluids into the atmosphere.

Background to the Invention

- 10 Vaporisers for dispensing perfumes and insecticides into the air or atmosphere are known. Generally these devices comprise a wick or element through which a liquid comprising active ingredients is drawn. In simple devices the active ingredients are dispersed from the wick by  
15 evaporation of the liquid into the atmosphere. Such devices may have problems in regulating the amount of active ingredient released into the atmosphere over a given period of time. The amount of evaporation will be in part dependent on atmospheric conditions in the region  
20 of the wick and thus will be generally beyond the control of the user. For example if the vaporiser is placed in a warm atmosphere evaporation will take place much more quickly than if the vaporiser is placed in a cooler atmosphere. In colder regions there may be significant  
25 problems in attaining a sufficient dispersal of active ingredients over a given period of time.

- In order to combat the above problems, devices have been manufactured which incorporate a heating element  
30 positioned around the wick of the device which causes sustained and increased evaporation of the perfume or insecticide from the wick, whatever the ambient atmosphere conditions in the region of the device. These devices

generally employ a power source such as batteries or a mains electricity plug to cooperate with a mains electricity socket, in order to provide power for the heating element.

5

There are inherent disadvantages in employing heating elements in such devices. A first problem is that the heating element can be a source of danger, such as a fire risk if flammable articles are inadvertently placed near the device when in use. Furthermore children may be in danger of being burned if the heating element is exposed in any way during or after use. Secondly, it can be difficult to control the rate of evaporation using a heating element, and relatively expensive thermostatic equipment may be needed to enable a user to adjust the rate of evaporation from the wick.

It is therefore an aim of preferred embodiments of the invention to overcome at least one of the problems of the prior art, whether expressly stated herein or not.

#### Summary of the Invention

Therefore, according to a first aspect of the present invention there is provided a fluid dispensing device comprising a liquid reservoir for housing a liquid, a wick, arranged, in use, to draw liquid from the liquid reservoir, and means to effect substantial airflow in the region of the wick and away from the device.

30

Thus, in use, the wick may be arranged to draw up liquid from the liquid reservoir by capillary action, the liquid evaporating from the end region of the wick; and the means

to effect substantial airflow in the region of the wick and out of the dispenser may assist in regulating the speed and amount of evaporation of the liquid from the wick, away from the device.

5

Suitably the wick is a porous ceramic wick. Preferably the ceramic wick comprises a porous, permeable silicone dioxide-aluminium dioxide ceramic material, more preferably having a silicon to aluminium ratio of between  
10 substantially 78 to between substantially 22. Suitably the pore size of the wick is between substantially 1 $\mu$ m and substantially 10 $\mu$ m, preferably between substantially 3 $\mu$ m and substantially 5 $\mu$ m.

15 Other suitable ceramics materials include porous silica and alumina, preferably having a pore size of between substantially 1 $\mu$ m and substantially 10 $\mu$ m, more preferably between substantially 5 $\mu$ m and substantially 10 $\mu$ m.

20 Alternatively the wick may be a textile wick, preferably constructed from textile fibres. Suitable textile materials include any porous or permeable textile, such as cotton, linen, flax, hemp, jute, and synthetic porous and/or permeable textiles materials, for example  
25 cardboard, paper and porous plastics materials.

Suitably the wick is housed in substantially the centre of the liquid reservoir.

30 Preferably the means for effecting substantial airflow in the region of the wick comprises means for effecting

substantial airflow across and/or around a portion of the wick.

Suitably the means for effecting substantial airflow in the region of the wick (hereinafter called "airflow effecting means") comprises airflow impelling means, arranged in use to impel air across and/or around at least a portion of the wick.

By "impelling", we mean mechanically driving or forcing airflow in a prescribed direction or directions, at an increased speed to that of airflow not under the influence of the impelling means.

Thus, in preferred embodiments of the invention the airflow effecting means comprises means to mechanically drive air across and/or around at least a portion of the wick.

Suitably the airflow effecting means effects airflow transverse to the longitudinal direction of the wick.

The airflow effecting means may be movable relative to the wick, such that airflow may be effected across and/or around substantially any desired portion of the wick.

The airflow effecting means may be adjustable, to increase or decrease the airflow in the region of the wick. Suitably the airflow effecting means is adjustable to increase or decrease the speed and/or volume of air passing across and/or around a portion of the wick.

There may be more than one airflow effecting means.

Suitably there are at least two airflow effecting means, preferably situated adjacent to the wick substantially on opposite sides of the wick. Alternatively the at least  
5 two airflow effecting means may be situated in any suitable orientation adjacent to the wick.

Suitably both airflow effecting means are arranged to effect airflow in substantially the same direction across  
10 and/or around the wick.

When the device comprises two or more airflow effecting means preferably at least two airflow effecting means are arranged substantially on opposite sides of the wick such  
15 that air is drawn through one airflow means and expelled across and/or around the wick and then drawn through the opposite airflow means and out of the device. This enables airflow to be effected quickly from outside the device, across or around the wick and out of the device,  
20 evaporating and dispersing some of the liquid within the device in an optimally efficient manner. With only one airflow effecting means there is a danger that airflow will be turbulent in the device and impede effective dispersion of evaporated liquid.

25

Preferably the airflow effecting means comprises a fan or turbine, preferably positioned to force air across and/or round a portion of the wick.

30 Suitably the speed of rotation of the fan is adjustable, in order to effect an increase or decrease of the airflow in the region of the wick.

Suitably liquid dispensing device further comprises a housing substantially surrounding the liquid reservoir, wick and airflow effecting means, and comprising at least one air outlet.

5

Suitably the air outlet comprises an aperture, preferably situated in the direction which the airflow is being directed by the airflow effecting means.

- 10 There may be more than one aperture, and preferably there are a plurality of apertures, such as in the form of a perforated portion of the housing, for example.

The air outlet may comprise an airflow effecting means  
15 described above, oriented to effect airflow out of the housing. Thus the air outlet may comprise a fan oriented to draw air through to the device and out of the housing.

The airflow effecting means may be operatively connected  
20 to timing means, to enable a user to operate the airflow effecting means for a desired period of time. The timing means may be arranged to effect operation of the airflow effecting means at prescribed intervals, for example  
25 60 second interval every 1 hour.

The airflow effecting means and/or timing means may be powered by a battery, but preferably the device comprises means to operatively cooperate with an electricity socket,  
30 preferably a domestic mains electricity socket, in order to power the airflow effecting means and/or timing means.

Suitably the device further comprises a liquid, located in the liquid reservoir.

Preferably the liquid is a liquid biocide, which may be a fungicide, bacteriocide, viricide, insecticide or any combination thereof.

According to a second aspect of the present invention there is provided a method of dispensing a fluid, comprising the steps of:

- (a) providing a device of the first aspect of the invention, wherein the liquid reservoir contains liquid; and
- (b) effecting substantial airflow in the region of the wick of the device, in order to increase the rate of evaporation of the liquid drawn through the wick and effect movement of the evaporated liquid away from the device.

The method may comprise performing step (b) intermittently or a plurality of times at prescribed time intervals.

The method may comprise, in the case of the device including means to cooperate with an electricity socket, a step between steps (a) and (b) of connecting the device to an electricity socket and activating the device.

#### Brief Description of the Drawings

For a better understanding of the various aspects of the invention, and to show how embodiments of the same may be put into effect, a preferred embodiment will now be

described by way of example with reference to the accompanying drawings, in which:

Figure 1 illustrates a cross-sectional side view of a preferred embodiment of the fluid dispensing device of the invention.

Figure 2 illustrates a cross-sectional side view of a second embodiment of the fluid dispensing device of the invention.

#### Description of the Preferred Embodiments

We refer firstly to Figure 1. A preferred embodiment of a fluid dispensing device 2 of the invention comprises a housing 4 enclosing a liquid reservoir 6 in which a liquid biocidal composition 7 is contained, and from which a ceramic elongate wick 8 extends into the housing 4. The liquid reservoir 6, liquid 7 and wick 8 are present as an integral liquid dispenser pack 5. The liquid biocide 7 is prevented from spilling out of the liquid reservoir 6 by cover 9 in the form of an elastomeric or plastics seal covering the reservoir and formed around the wick 8. The wick 8 is clamped in position via a clamping means consisting of a clamping cap 16 adjustably connected to a clamping arm 18 via a screw thread 19 and cooperating wing-nut 20. The clamping cap 16 is arranged, in use, to cover the free distal end of the wick 8, and tightened onto the end of the wick 8 by action of the wing-nut 20.

30

The device 2 further comprises means for effecting substantial airflow in the region of the wick 8 in the form of a first fan 10 and a second fan 12 located on the

housing 4 wall adjacent to the central portion of the wick 8. The fan 10 is connected to an electrical plug (not shown) and is operatively connected to an apertured mesh screen 14 formed into the housing 4 wall adjacent to the fan 10. Located on the housing 4 wall on the opposite side of the wall to the fan 10 is the second fan 12, operatively connected to a second mesh screen 28 formed into the housing 4 wall. The second fan 12 and second mesh screen 28 are situated further up the housing 4 wall than the first fan 10 and mesh screen 14.

The housing 4 also includes a timing means in the form of an electric timer and fan controller 22 which is operatively connected to fans 10 and 12. The housing 4 further includes an ON/OFF switch connected to the fans 10 and 12 and a carrying handle 26 on the top of the housing 26.

Use of the fluid dispensing device will now be described with reference to Figure 1. When it is desired to utilise the device 2, the housing 4 is connected to an electricity socket, such as a domestic electricity socket, via the plug on the housing (not shown). The ON/OFF switch is then turned to the ON position in order to activate the fans 10 and 12. Both fans 10 and 12 are oriented to effect airflow in the same direction such that the second fan 12 draws air into the housing 4 through the mesh screen 28 and creates airflow across the wick 8, and the fan 10 is oriented to draw airflow across the wick 8 and out of the housing 4 through the mesh screen 14, which acts as an air outlet.

The wick 8 draws liquid biocidal composition 7 from the liquid reservoir 6 by absorption through its porous ceramic structure, through capillary action. As airflow is created across the wick 8 by the fans 10 and 12, the liquid biocidal composition 7 evaporates from the wick 8. The rate of evaporation from the wick 8 is quicker than the natural rate of evaporation without an airflow being effected across the wick 8 by the fans 10 and 12. The timer and fan controller 22 can be used to increase or decrease the speed of one or both of the fans 10 and 12 in order to effect increased or decreased airflow across and around the wick 8, thus relatively increasing or decreasing the rate of evaporation of the liquid biocidal composition 7 from the wick 8. The timer/fan controller 22 can also be used to allow a user to limit the operation of one or both of the fans 10 and 12 to prescribed time intervals or intermittent operation, when the ON/OFF switch is in the ON position, for example allowing operation of the fans for 60 seconds in every 1 hour.

20

The device 2 may be turned off at any time by turning the ON/OFF switch to the OFF position and/or unplugging the device 2 from the electricity socket.

25 We refer now to Figure 2.

In an alternative preferred embodiment of the invention, shown in Figure 2 the housing 4 includes a detachable panel 30 on the upper surface of the housing 4 through which the liquid dispensing pack 5 may be removed and inserted. The embodiment shown in Figure 2 functions in a similar manner to that of the embodiment described for Figure 1. Like numerals represent like components.

Eventually, the liquid biocidal composition 7 in the liquid reservoir will be exhausted through evaporation from the wick 8. When this happens the device 2 is turned  
5 off, if needs be, and unplugged from the electricity socket to which it is connected. The housing is then opened by removing the panel 30 in order to access the inside of the device 2. The liquid dispenser pack 5 can then be removed by unscrewing the wing-nut 20 and lifting  
10 the clamping ring 16 from the wick 8. The liquid dispensing pack 5 can then be lifted out of the device 2 and a fresh pack 5 including liquid biocidal composition 7 inserted and clamped in position as described above.

15 Alternatively, the liquid dispensing pack 5 may not be completely sealed, and when the panel 30 is removed, the user may refill the liquid reservoir 6 with biocidal composition 7 through the opening created, by for example squirting the composition 7 directly into the liquid  
20 reservoir through a suitable conduit or syringe.

In an alternative embodiment of the invention there may be only one airflow effecting means, such as a single fan, for example, arranged to draw in air from outside of the  
25 device, or expel air from the device. Where only one fan is used, the opposite side of the housing of the device, may include at least one air inlet aperture to allow ingress of air, and/or at least one air outlet aperture to allow egress of air.

30

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and

which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

- 5 All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features  
10 and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same,  
15 equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

- 20 The invention is not restricted to the details of the foregoing embodiment(s). The invention extend to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel  
25 combination, of the steps of any method or process so disclosed.

**Claims**

1. A fluid dispensing device comprising a liquid reservoir for housing a liquid, a wick, arranged, in use, to draw liquid from the liquid reservoir, and means to effect substantial airflow in the region of the wick and away from the device.
2. A device as claimed in Claim 1, wherein the wick is a porous ceramic wick.
3. A device as claimed in Claim 1, wherein the wick is a textile wick.
4. A device as claimed in any one of Claims 1 to 3, wherein the wick is housed in substantially the centre of the liquid reservoir.
5. A device as claimed in any preceding claim, wherein the means for effecting substantial airflow in the region of the wick comprises means for effecting substantial airflow across and/or around a portion of the wick.
6. A device as claimed in any preceding claim, wherein the means for effecting substantial airflow in the region of the wick comprises airflow impelling means, arranged in use to impel air across and/or around at least a portion of the wick.
7. A device as claimed in Claim 6, wherein the airflow effecting means comprises means to mechanically drive

air across and/or around at least a portion of the wick.

- 5 8. A device as claimed in any preceding claim, wherein the airflow effecting means effects airflow transverse to the longitudinal direction of the wick.
- 10 9. A device as claimed in any preceding claim, wherein the airflow effecting means is moveable relative to the wick such that airflow may be effected across and/or around substantially any desired portion of the wick.
- 15 10. A device as claimed in any preceding claim, wherein the airflow effecting means is adjustable to increase or decrease the airflow in the region of the wick.
- 20 11. A device as claimed in any preceding claim, wherein there are two airflow effecting means.
12. A device as claimed in Claim 11, wherein the airflow effecting means are situated adjacent to the wick substantially on opposite sides of the wick.
- 25 13. A device as claimed in Claim 11 or 12, wherein both airflow effecting means are arranged to effect airflow in substantially the same direction.
- 30 14. A device as claimed in any preceding claim, wherein the airflow effecting means comprises a fan or turbine.

15. A device as claimed in any preceding claim, wherein the liquid dispensing device further comprises a housing substantially surrounding the liquid reservoir, wick and airflow effecting means, and comprising at least one air outlet.
16. A device as claimed in Claim 15, wherein the air outlet comprises an aperture.
17. A device as claimed in Claim 15 or 16, wherein the air outlet comprises an airflow effecting means, oriented to effect airflow out of the housing.
18. A device as claimed in any preceding claim, wherein the airflow effecting means is operatively connected to timing means, to enable a user to operate the airflow effecting means for a desired period of time.
19. A device as claimed in Claim 18, wherein the timing means is arranged to effect operation of the airflow effecting means at prescribed intervals.
20. A device as claimed in any preceding claim, further comprising a liquid, located in the reservoir.
21. A device as claimed in Claim 20, wherein the liquid is a liquid biocide.
22. A method of dispensing a fluid, comprising the steps of:
- (a) providing a device of any one of Claims 1 to 21, wherein the liquid reservoir contains liquid; and

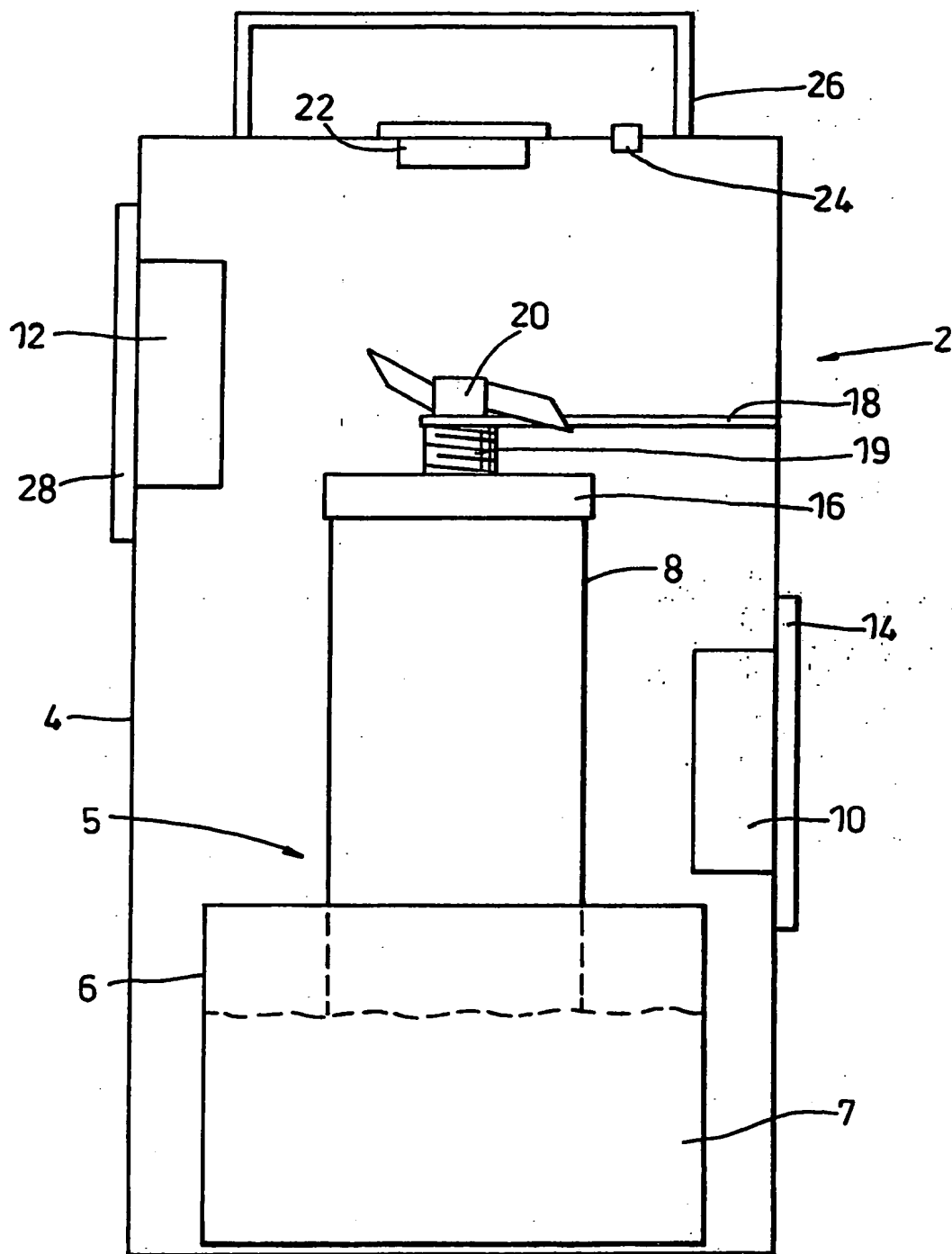
(b) effecting substantial airflow in the region of the wick of the device, in order to increase the rate of evaporation of the liquid drawn through the wick and effect movement of the evaporated liquid away from the device.

23. A method as claimed in Claim 22, comprising performing step (b) intermittently or a plurality of times at prescribed time intervals.

24. A liquid dispensing device substantially as described herein with reference to the accompanying drawings.

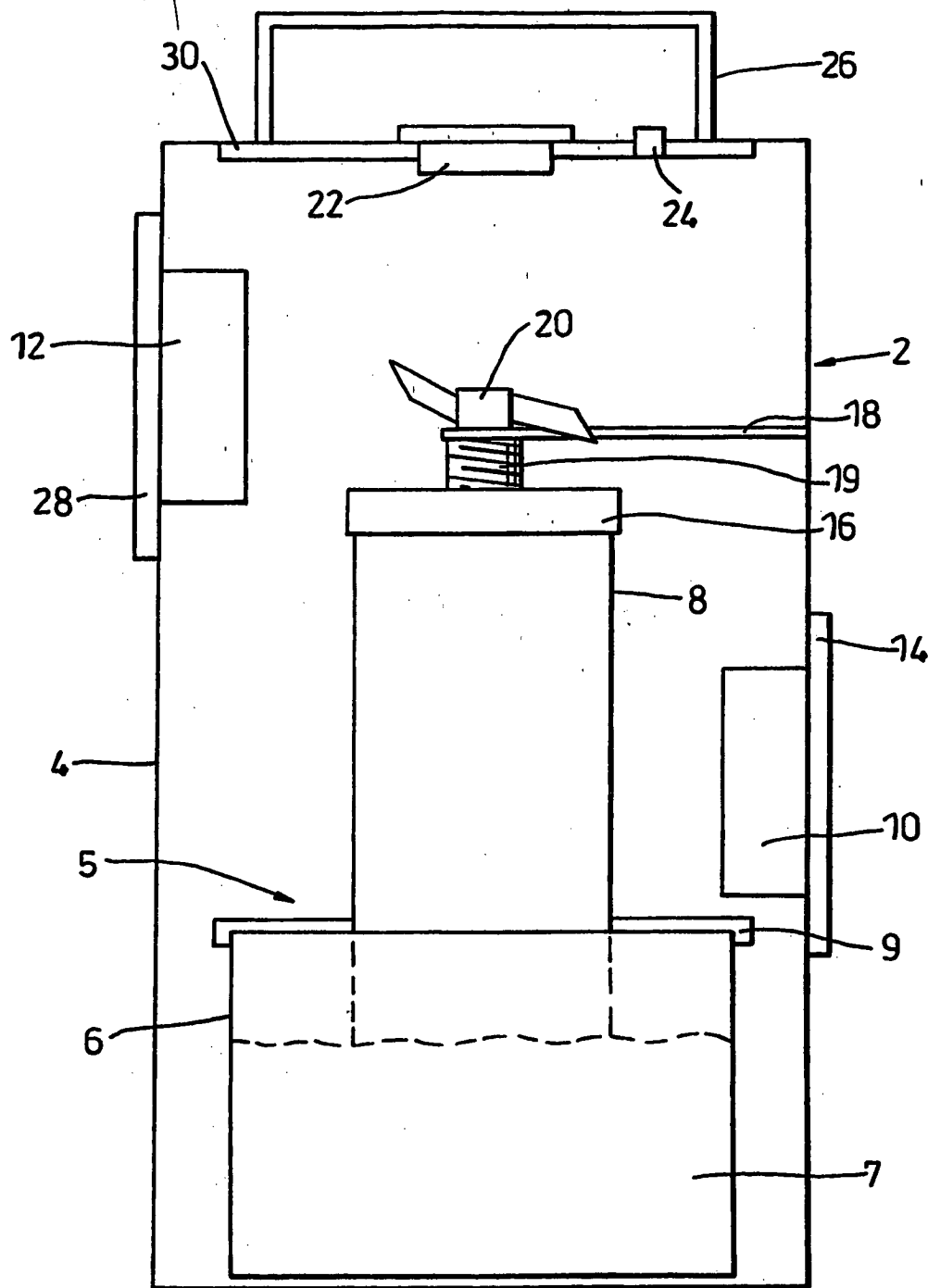
25. A method substantially described herein, with reference to the accompanying drawings.

1/2



**Fig. 1**

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**Fig. 2**

# INTERNATIONAL SEARCH REPORT

International location No

PCT/GB 03/04251

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61L9/12 A61L9/16 F24F6/04 B60H3/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61L F24F B60H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 90 03 654 U (WOHLAND P ET AL) 28 June 1990 (1990-06-28)  page 3, line 1 -page 6, line 15 page 7, line 23-32 page 8, line 17-19 page 9, line 13-30 page 10, line 12-19 figures 1,4	1,3-10, 14-20, 22-25
X	AU 664 685 B (RONALD ALFRED ROBERTS) 23 November 1995 (1995-11-23)  page 2, line 22-26 page 3, line 15-30 page 6, line 15-25 page 7, line 24 -page 9, line 6	1,3-8, 14-17, 19-22, 24,25
	-/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
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- \*G\* document member of the same patent family

Date of the actual completion of the international search

10 March 2004

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18/03/2004

Name and mailing address of the ISA

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# INTERNATIONAL SEARCH REPORT

International Application No  
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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 6 105 916 A (AUSTIN JOHN A ET AL) 22 August 2000 (2000-08-22)</p> <p>column 1, line 10-17 column 2, line 26-53 claim 13; figures 1,2</p>	<p>1-7, 14-17, 20-22, 24,25</p>

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